



**CHILLER SYSTEM COOLING UNITS**

# **OPERATING MANUAL**

**IBS ISITMA SOĞUTMA HAVALANDIRMA TAAHHÜT SAN. VE TİC. A.Ş**

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## 1.DATA ABOUT THE DEVICE

Model / Type	
Feeding	V
Phase	
Frequency	50 Hz
Total Power	kW
Cooling Capacity	kW ( +2 / +45 °C )
Cooling Fluid	
Length	mm
Width	mm
Height	mm
Weight	Kg
Serial Number	

## 2. GENERAL OPERATING INSTRUCTION

This operating manual contains information necessary for installation, operation and maintenance of Chiller Units manufactured by IBS Isıtma Soğutma Havalandırma Taahhüt San. ve Tic. A.Ş. This manual should be considered as an integral part of the unit and should be read by the technician who shall install and operate the cooling unit. This manual should be kept near the unit for application when needed.

Before installation and operation of the unit, please be sure to read the manual attentively. It is important for your safety to understand the concepts in this manual. Please, ask for technical support from a cooling technician. Conform to the instructions in this manual for safe and efficient use of your unit.

No cooling fluid and oil should be used other than those stated on label of the unit. The system should not be operated before completion of installation and gas charging stated on label of the device.

*The manufacturer doesn't bear any responsibility due to losses and damages arising out of use, operation and applications not stated in this manual.*

### 2.1- In Case of Danger

- Cut off mains voltage.
- Contact with the nearest service.
- Don't apply anything to the device except for emergency interventions until the authorized service directed by our service center comes.

### 2.2-Operations upon the Unit

- Installation, operation and maintenance should be performed by a qualified cooling technician.
- While making any operation upon the unit, the mains electrical feeding should be cut off and the unit should wait for 10-15 minutes for cooling.

### 2.3-Features of Place of the Unit

- No dust.
- The floor should be rigid, sound and safe taking weight of the unit into consideration.
- Should be protected against flood and being left under snow.

- Should be mounted in a place which doesn't prevent air induction and release and which is open to atmosphere.
- If installed in a closed area, it should absolutely have sufficient ventilation and there shouldn't be overheating.
- Be sure all measures about human health and environmental safety are taken.

### 3.SAFETY WARNINGS

- Try to understand safety warnings and take necessary precautions.
- Pay attention to the warnings to prevent damages to you and your goods.
- Even if you have sufficient experience and knowledge, if you are not authorized, and if you don't have sufficient experience and knowledge even if you are authorized, never attend to adjustments, controls, installations and repair works.
- Cable installations and connections to the device should be in accordance with electricity norms, and device bodies should absolutely be grounded against failures of insulation.
- Be sure that electrical power source and the electrical need of the device is compatible.
- Protect the system with a fuse and main breaker having appropriate amperage.
- Be sure that all cables of cabling operations are far away heat source and rotating fan rotor.
- During assembly of devices, wear gloves against sheet cuts.
- Protect condenser and gas circuit pipes while carrying them. If gas circuit pipe or condenser tears accidentally, protect yourself and your face (especially eyes) against pressurized gas.
- Don't operate the device without being sure that it is fixed well.
- Control leakages at input unions or flanges while applying water to the system and release the air by opening the valve on the evaporator, take precautions to prevent splashes of pressurized air and water. Prevent buffer tank (if available in the system) to swell under pressure due to air.
- Don't control condenser fans manually while they are operating, don't make direction control before the fans stop completely.
- The weight is 850-2500 kg, and the device should be carried by professional teams, the cranes and forklifts with sufficient power should be used.

- No shelter should be placed above the device, no weights should be put on the condenser.
- There is no part in the cooling group that can be repaired by the user. Call authorized service in case of failure.
- Control panel has fatal electrical voltage. Turn on the mains electrical feeding switches and label with a sign of work before maintaining or repairing the equipment.
- Cable installations and connections to the device should be in accordance with electricity norms, and device bodies should absolutely be grounded against failures of insulation.
- High pressure line and compressor heads have a temperature of 120°-160° C, and interventions should be made after waiting for 15-20 minutes for cooling of these parts after the system is stopped.
- The units subject to high internal pressure during operation. The pipes and equipment containing pressurized gas are made of materials resistant to internal and external forces. Damages to the pipes and equipment during transport, installation and maintenance shall decrease safety of the unit. Don't allow any equipment to be damaged by external effects.
- All tests, adjustments and controls of the units have been performed. Don't change connections and adjustments of equipment during installation, maintenance and service.
- The units are not harmful to human health and environment.
- Electrical board and circuits are only for authorized personnel. Safety and protection precautions in these fields are valid as long as you don't change adjustments and connections. Direct or indirect contact with these fields may lead to danger. Don't touch any electrical cables, boards, tools and connections for any reason whatsoever. Keep away these fields and be sure that you are insulated.
- The units contain switches, thermics, contactors and similar mechanisms prepared to create a certain safety and precaution mechanism to allow for performance of functions in the units. Don't interfere with these mechanisms. Replace if they are damaged.
- Mechanical risk parts are insulated from surrounding as they are constructed within a closed structure. Don't open the cap and protections while the machine is operating. If it is open, close the cap before starting the machine. Be careful while touching these fields even if the machine isn't operating.

- Keep away from hot fields and surfaces of the machine. Don't remain close to these fields and don't contact directly or indirectly. Even if the machine isn't operating, wait for their cooling before touching these fields.
- There are warning labels on the units against the situations (stated or not stated in this manual). Don't touch or keep away the places with warning labels. Conform to the instructions on the labels.
- If the labels become illegible, replace them. You can find meanings of labels and which instructions shall be applied in the section titled "Meanings of Safety Labels" of this manual.

### 3.1 Meanings of Safety Labels



This "ATTENTION" sign is an important safety warning.



High voltage. Fatal Electrical Voltage.

It is used to protect the user or maintenance personnel from touching the parts or fields bearing risk of electricity when the machine is operated or a break is given. This label means that there is an electrical risk here. Don't touch these places without an insulation protector or turning off power source. Don't apply water, oil or similar substances even for cleaning purposes. Be sure that these fields are always insulated. Don't give damage to the cap, protection and insulation equipment.



Risk of Burning

It is used to protect the user or maintenance personnel from the risk of touching anywhere. This label means that there is a risk of electricity or burning at these fields. Don't touch the fields with this label or take all necessary precautions.



Protective Gloves Should Be Worn

It is a warning sign used to remind the personnel to wear protective gloves when the machine is operated or a break is given. Wear your gloves if you are working in the places with this label.

#### 4. DEFINITION AND OPERATING PRINCIPLE OF THE MACHINE

Standard type Water Cooling groups (chiller) are manufactured with air cooling or water cooling condensers. As the devices are manufactured in packages, their assembly is very easy and they require minimum maintenance. In air cooling types, condenser surfaces are selected big to reach maximum capacity and efficiency. Axial ventilators are self-motored and have very low sound pressure. Optionally, Air cooling condensers can have copper pipe and copper fin, and Water cooling condensers can be manufactured with Cupro-Nickel pipes.

According to the capacities needed, the Water cooling groups with Air cooling condensers manufactured in 8 different types include all components required for cooling technology.

These components and their properties are as follows:

1. Main Body: It is made of Galvanized sheet with appropriate thickness and qualities and designed as required by thin metal sheet technique to prevent vibration and provide maximum resistance. Outer surfaces are painted with a special paint against rust and external effects.
2. Caps: The frontal side and back caps in appropriate construction and qualities ensure that the device is protected against outer atmospheric effects and general maintenance is easy,



and the inner components are reached easily. The upper internal caps ensure that the control panel can be carried and electrical board is protected from water and dust (weatherproof).

3. Chiller (Shell and Tube Evaporator): It is the component which takes heat from and cools the water to be cooled by evaporating the liquid cooling fluid coming from thermostatic expansion valve while passing through krochill copper internal pipes under low pressure and temperature. The evaporator formed by lining up flat or U-shaped twisted copper flat or krochil pipes placed upon steel mirror using fixation method by means of machinetto has an optimum frontal surface and ensures maximum heat permeability.
4. Condenser: It is the component which gives heat to the external environment by condensing compressed hot gas cooling fluid coming from the compressor while passing through serpentine under a fixed pressure. The battery formed by lining up aluminum fins upon copper pipes in an automatic machine with a pitch of 2,1 – 3,2 mm by means of hydraulic fixation method and by connecting pin pipes the aforementioned side of which is given “U” shape in automatic machines by silver welding with special type copper elbows has an optimum frontal surface and ensures maximum heat permeability.
5. Condenser Fans: The condenser fans are coupled to a motor with a static and dynamic balance at a total pressure which can compensate static pressure loss of Condenser Batteries, which is very silent thanks to aerophil fins and operates vertically with a full closed thermistor protected silent bearing. Fan fins are protected thanks to the special protection cage.
6. Cooling Compressor: It absorbs the cooling fluid at low pressure which has completed cooling process by evaporating in the evaporator (R407F,R407C,R410A,R404A) in the form of cold gas, and pumps to the condenser in the form of superheated gas at high pressure by means of compressing. A crankcase heater is used in the compressors, and therefore, the liquid cooling fluid accumulating in the crankcase is separated from oil and the compressor is not allowed to operate without oil. As the compressors are mounted within the body upon special vibration wedges and using vibration absorber pipe elements, all sorts of vibration are prevented to affect the device. Compressors are protected with no-load operating and excessive current relays and the required mains current is 400/3/50 Hz.

#### ATTENTION

The system should be equipped with regulators or special protective relays against changes in mains electricity (-10%) or between phases (-3%). Electrical motor blows are out of warranty.

### Cooling Circuit Elements:

1. Drier: Dehumidifies the freon gas. The solid core within the shell on liquid line changes between 1-2 pieces according to capacity of the device.
2. Sight Glass: It is placed upon liquid circuit to control transit of liquid fluid. Furthermore, it shows humidity in the cooling gas.
3. Thermostatic Expansion Valve: Decreases temperature of liquid fluid under high pressure at the input of evaporator by expanding at fixed enthalpy. Controls superheat by means of the bulb mounted on suction stroke and adjusts the amount of cooling fluid entering the chiller and therefore heating capacity of the chiller.
4. Solenoid Valve: Turns on and off liquid circuit according to the warning from control panel. It is mounted on cooling fluid circuit. Allows the system to operate without load.
5. Low/High Pressurestat: Prevents low and high pressures at suction and discharge sides of the compressor to go beyond the desired lower and upper limits in any case and makes the pressures to always remain within the suction limits.
6. Liquid Valve: Provides opportunity of vacuuming, and therefore, provides the opportunity to change broken parts in the circuit without any gas leakage. It is available on the liquid circuit.
7. Suction and Discharge Valves of the Compressor: Mounted on suction and discharge circuits of the compressor. They have 1/4" unions in order to measure suction and discharge pressures of the compressor, and prevents air inlet to the system by closing suction and discharge pipes in case of compressor failure. Seat of the valves closes the circuit when it is driven forward, and provides connection of manometer kit to the system without any air inlet by closing 1/4" unions when driven backward completely.

AIR COOLING CHILLER UNITS				WATER COOLING CHILLER UNITS			
SHELL AND TUBE		HEAT EXCHANGER		SHELL AND TUBE		HEAT EXCHANGER	
SINGLE COMPRESSOR SINGLE CIRCUIT SYSTEMS				SINGLE COMPRESSOR SINGLE CIRCUIT SYSTEMS			
SCROLL COMPRESSOR		SCROLL COMPRESSOR		SCROLL COMPRESSOR		SCROLL COMPRESSOR	
SEMI HERMETIC COMPRESSOR		SEMI HERMETIC COMPRESSOR		SEMI HERMETIC COMPRESSOR		SEMI HERMETIC COMPRESSOR	
DOUBLE COMPRESSOR SINGLE CIRCUIT SYSTEMS				DOUBLE COMPRESSOR SINGLE CIRCUIT SYSTEMS			
SCROLL COMPRESSOR		SCROLL COMPRESSOR		SCROLL COMPRESSOR		SCROLL COMPRESSOR	
SEMI HERMETIC COMPRESSOR		SEMI HERMETIC COMPRESSOR		SEMI HERMETIC COMPRESSOR		SEMI HERMETIC COMPRESSOR	
DOUBLE COMPRESSOR DOUBLE CIRCUIT SYSTEMS				DOUBLE COMPRESSOR DOUBLE CIRCUIT SYSTEMS			
SEMI HERMETIC COMPRESSOR		SEMI HERMETIC COMPRESSOR		SEMI HERMETIC COMPRESSOR		SEMI HERMETIC COMPRESSOR	

Installation and operation of Chiller Cooling Unit should be performed by a qualified cooling technician in accordance with general safety rules. Information such as model, typical functions and serial number is available on the label upon the device. If you need help or further information, please state model and serial number.

## 5.CYCLE DIAGRAM AND EQUIPMENT

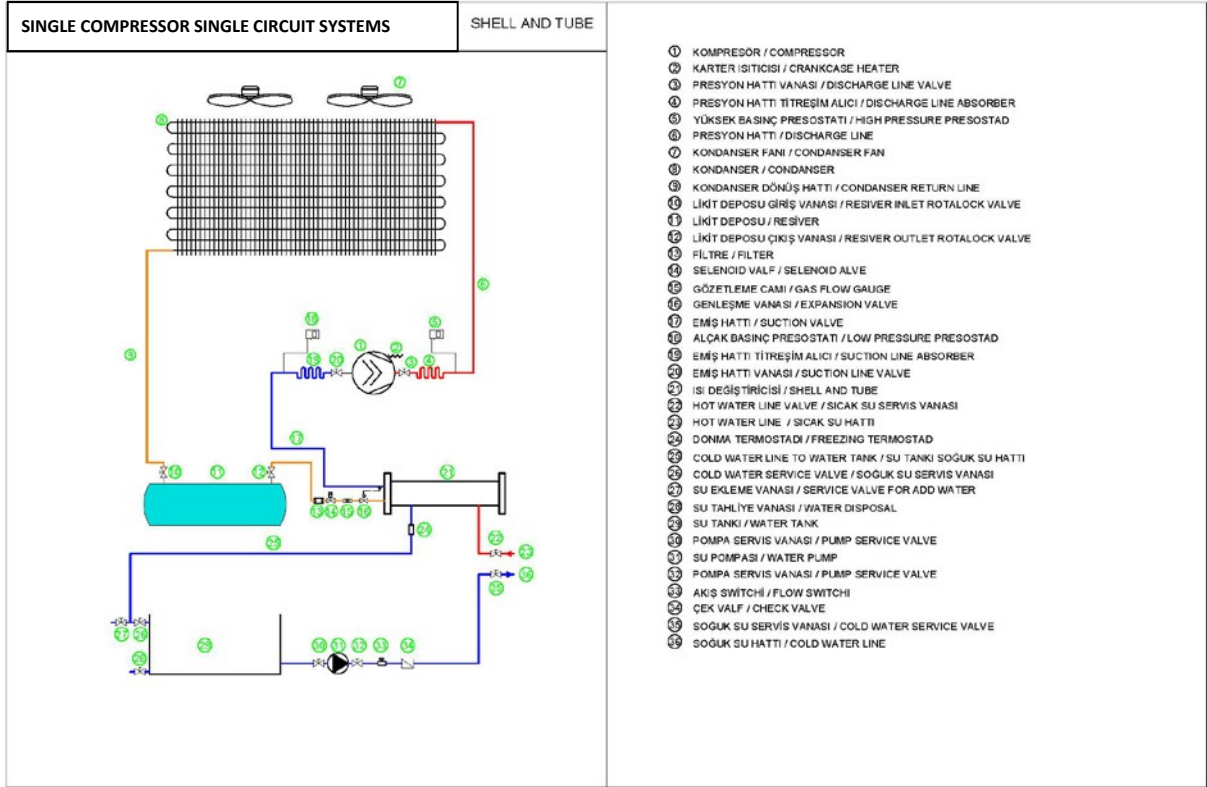


Diagram 1 – Diagram of Single Compressor Single Circuit System

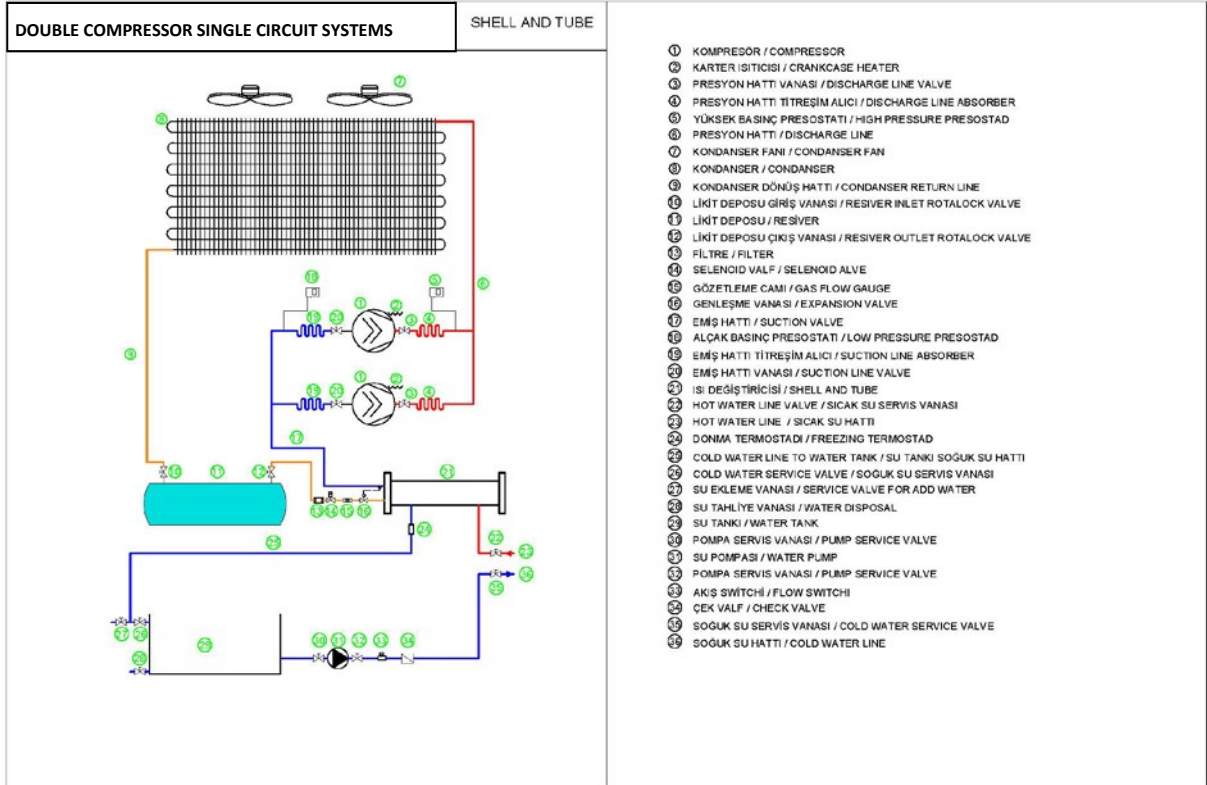


Diagram 2 – Diagram of Double Compressor Single Circuit System

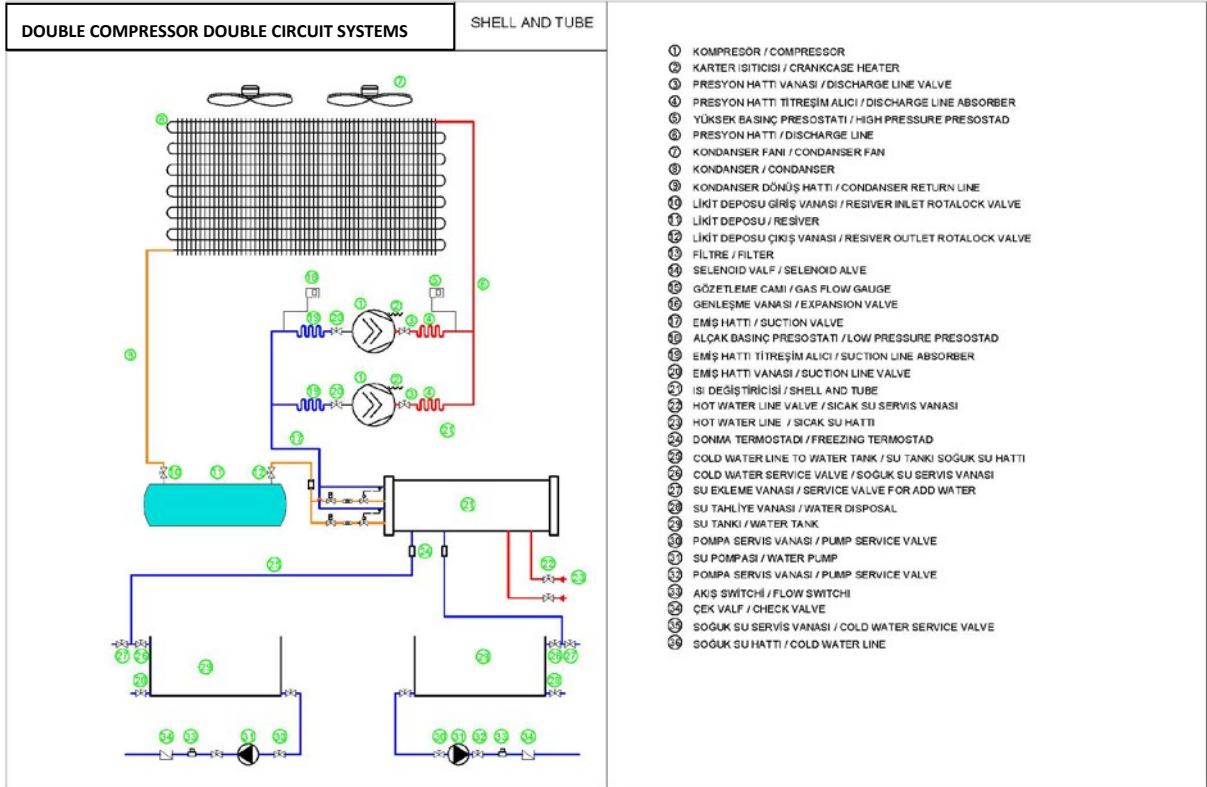


Diagram 3 – Diagram of Double Compressor Shell Double Circuit System

## 6.FIELD OF USE and INTENDED USE

Chiller Cooling Systems manufactured by IBS Cooling Systems are designed and intended to use in the applications such as Plastic injection machines, Extruder pipe and cable machines, Sole Cooling machines, Printing House machines, Milk Pasteurization devices, Dye Manufacturing cylinders, Canvas Spinning cylinders, Textile and Thread Industry, Oil Winterization Facilities, Air-Conditioner Facilities, Wine Fermentation and etc.

## 7.PACKAGING, CARRYING and STORAGE



### CARRYING:

Water cooling (Chiller) groups should be carried with Forklifts or using belt rope while lifting directly. It is useful to place a soft material (such as Styrofoam, cardboard or cloth) between the belt and rope to prevent paint of the device from being scratched. During lifting, the weight should be balanced. For horizontal carryings, the device should be placed on caterpillar pullers without allowing any shift. During horizontal and

vertical carrying, the device should never be carried side or upside down; otherwise, the compressor gets damaged.

### STORAGE:

If water cooling (Chiller) groups are required to wait for a long time during building construction, the stretch upon them should be removed and the device should be covered with cardboard or wax cloth to allow for ventilation. If the storing area is damp, sufficient ventilation should be provided; otherwise, there will be mildews. The device should be protected against being stepped on.

## 8.COMMISSIONING

In order to continue warranty cover, the Central System Cooling Units should be assembled and operated by an experienced, trained and qualified cooling technician, and regular maintenances and controls should be performed. During installation, all norms should be conformed, and especially electrical cable installation, pressure safety switch adjustments and the relevant set values should not be changed.

The devices should not be operated without taking necessary precautions (consult the manufacturer about precautions) at ambient temperatures under  $-30^{\circ}\text{C}$  and above  $+48^{\circ}\text{C}$ . Relative humidity rate of the air is not important for operation of the devices; however, as the devices include electrical equipment, they should be installed in the places protected against floods.

Conform to the instructions on installation, operation and maintenance. Please, examine the information given in the manual. Consult the manufacturing firm for more information.

For desired efficiency and operation of Central System Cooling Units, the following criteria should absolutely be observed while determining locations of the devices.

Before the installation;

The unit should be controlled for possible damages during carrying. Quality workmanship and materials should be used in selection of pipe fittings, design of installation and assembly.

### *8.1 Place of Installation*

- Water cooling (Chiller) groups should be seated on a sound base floor. Declination state should be controlled using water gauge to prevent accumulation of water at the base of the device.
- For easy removal and cleaning of batteries, filters, fans and compressors, for easy opening of the cap of electrical control board, there should be sufficient service space in front of them.
- Pipe connections to the device should be elastic connections. The reason for this is to prevent transfer of any vibrations in the device or installation to each other. The flexible connection between the flange on the device and installation pipe should be fixed well.
- Flange axes should be same. Weight of pipe should not be carried by device.
- In order to prevent any remaining of air within the chiller, an air bleeding purgor should be mounted at the highest point. And, a discharge valve is placed at the bottom.
- If the Chiller will not operate for a long time, the water inside it should be emptied against freezing in winter. In the areas with air temperature under 0 °C during winter, ANTI-FREEZE should be put into the system.
- If condenser of water cooling group will be put in a separate place (split type), there should not be any elements which are restrictive and increase the possibility of leakage upon the pipe line between air cooling condensers and the device such as elbows and joints as much as possible.
- Level difference between the condenser and device should be max. 15 m.
- Copper pipe line should not be subject to open air conditions (sun, rain, etc.) and not be passed through protected areas within the building.



Furthermore, it should be easier to repair the pipes against any leakage.

- The condenser should be placed in a shady area where the air suction side doesn't contain any dust and relatively corrosive chemical substances and there is abundant air.

## 8.2 Assembly

Taking weight of the device into consideration, the floor upon which the device will be placed should be in capacity of carrying weight of the device and the device should be fixed to the floor vertically and flatly.

Chiller Cooling Units are designed especially to operate silently. There should be no vibration while installing the unit.

The unit should be installed on a sound and fixed support safely. It is recommended to separate the unit from its support using anti-vibration pads or blocks. The pipes should be as flexible as not to transfer vibration.

## 8.3 Copper Pipe Connections

After installation and connection of the unit has been completed, pipe connections should be made. The system pipes should be compatible with ASHRAE guidelines in order to reach maximum operating efficiency. For accurate and efficient operation of the system, all necessary **pipe designs and installations are at the responsibility of the user.**

## 8.4 Electrical connections

Your water cooling group operates with 400V, 50 Hz, 3 phase mains electricity. Enter NYM cable and 3 phase cable of the system with appropriate thickness conforming to package type switch within electrical board. Moreover, enter neutral cable to the neutral connector. Ground body of the device with ground wire. "Connect ground wire to neutral section of ground bus bar." Bring grounding and electrical cable installation up to the device board in accordance with EN 60204-1 and enter to the connectors. Your device was tested in the factory. And, the electrical board was manufactured and tested in accordance with EN 60204-1.

### 8.5 Leakage (NITROGEN) test

After copper pipe and electrical connections of Chiller cooling units are performed, leakage test is performed in our factory. If it is required to repeat leakage test after system revision; use Nitrogen or Carbon dioxide gas for applying pressure to the system.

**Never use Oxygen or Acetylene gas for pressure application.**

**These gases lead to great and dangerous explosions.**

During the test, all necessary precautions relating to safety and control elements that may be affected from pressure should be taken. All solenoid valves should be on. Maximum pressure of 15 Bar should be applied in suction line and 25 Bar in discharge and liquid line. All conical and solder connections should be controlled against leakage.

Nitrogen should be left in the system as pressurized for 12 hours. If no pressure decrease is detected, this means that there is no leakage. Therefore, nitrogen can be discharged from the system. After nitrogen test, the system should be connected to a vacuum pump. Vacuum all system with the vacuum pump until 755mm HgS vacuum is obtained. Turn off vacuum pump when 755mm HgS vacuum is obtained. After waiting for at least 4 hours, it means that there is no leakage if no increase is observed in vacuum manometer. After vacuum process, gas can be applied to the system through liquid line (control machine label in order to determine the correct cooling gas).



**NEVER OPERATE THE COMPRESSORS WHEN THE SYSTEM IS UNDER VACUUMING.**

### 8.6 Gas charging

Fill Chiller Cooling Units only with the cooling gas it uses (see the label). If the cooling fluid is a mixture, the gas should be filled only in liquid form in order to prevent changes in compound rates of the mixture.

The remaining gas shall be filled while the unit is operating until the system reaches nominal operating conditions. Before powering the system, please see the part titled "Control before Starting".

## *8.7 Control before Starting*

Control whether the voltage of power unit is same with the voltage of Chiller Cooling Unit (fan(s)).

Control calibration of electrical protection devices.

Control whether service valves are completely on or not.

Control whether heater of crankcase operates or not.

Control whether the fans on the unit rotate freely or not.

Control whether condenser fins are clean and there is nothing preventing air circulation.

Control the facility against possible failures.

## *8.8 Operation of the System*

- Bring On/Off switch on control panel of all evaporators connected to the Chiller Cooling Unit to on position.
- Control degree adjustment value on control panel of the evaporators.  
Be sure that solenoid valves are on.
- Turn on main switch on the electrical mains feeder through main distribution board.
- Firstly, turn on package type switches (only available for 3-phase fans) belonging to the fans on the control panel upon Central Cooling Unit. Then, turn on package type switches of the compressor on the control panel with intervals of 30 seconds. Condenser fans and cooling compressors shall activate and deactivate the compressor and fan automatically according to the commands of micro-processor in control panel in accordance with need of the system.
- Control high and low pressure values of the system through the manometers on the unit.
- Control whether the cooling compressors within the unit are overheated or not.
- Control oil levels of the compressor through the indicator on compressor crankcase.
- Make sealing control.
- Make an overall control of the facility, and make sure the facility operates properly.

## 8.9 Turning off the system

If you don't need cooling process for a while, you can turn off the system using On/Off switch on the control panel.

## 9. INSTRUCTIONS FOR OPERATION AND MAINTENANCE

The main switch within electrical control board should be open for 24 hours in order to commission the system. This switch is turned off after accumulation of cooling gas in liquid tank if the system shall not be used for a long time. This switch should never be used for daily on/off operation of the system.

Before the system is operated, frontal caps of water cooling group are opened. Gas leakage is controlled through sound or visual controls. If there is any oiling on the copper pipes, it means that there is gas leakage at unions or countersinks. Tighten the union leaking gas mildly, test with foam; if you cannot solve the problem, turn off the system and valves and call authorized service.

OPERATIONS TO BE PERFORMED	MAINT.	AUTHORIZED
Visual control of gas leakage and oiling	Daily	Operator
Control of oil level of compressors	Seasonal	Operator + Service
Control of taking heat (overheating)	Seasonal	Operator + Service
Control of electrical voltage, contactor, auxiliary relay	Seasonal	Operator + Service
Load control of sight glass refrigerant	Seasonal	Service
Control of heating operation of compressor crankcase	Seasonal	Operator + Service
Tightening of all electrical connections, sockets and shoes	Seasonal	Service
Control of operation and liquid line of the compressor's solenoid valves	Yearly	Service
Control of adjustment thermostat and safety equipment	Yearly	Service
Control of main switch	Yearly	Operator + Service
Control of Chiller's circulation pump	Seasonal	Operator + Service
Filter cleaning (if available in front of the pump)	Monthly	Operator
Change of filter (if torn)	Seasonal	Operator
Control of fan and motor bearings	Seasonal	Service
Change of compressor oil and cleaning of crankcase filter	5000 hours	Service
Change of drier	5000 hours	Service
Complete revision of compressor valve plate change	10000 hours	Service

## 10. REASONS and SOLUTIONS FOR SYSTEM PROBLEMS

A table about problems-reasons-solutions is given below. It should be taken into consideration that many problems require solutions beyond capacity of the user. Such problems can be solved by authorized service personnel with good equipment. Try to solve the problems in accordance with the following instructions. Don't forget that continuing to operate the unit without solving the problems may lead permanent damages in the future. If you cannot solve the problems by yourself, please contact with the nearest service provider.

PROBLEMS FOUND IN CHILLER COOLING DEVICES AND THEIR SOLUTIONS		
PROBLEMS	REASONS	TYPE OF DEVICE
Excessive high pressure		
Operating current increases Efficiency decreases (COP) Cooling capacity decreases Due to high discharge temperature, oiling deteriorates, compressor breaks down	By-pass in condenser	Air cooling
	High external ambient temperature	Air cooling
	Insufficient condenser flow	Air cooling
	Dirty condenser	Air cooling
	Non-condensing gas in the system	Common
	Excessive gas charge	Common
	Insufficient condenser water flow	Water cooling
	High temperature of condenser's cooling water	Water cooling
Insufficient fluid circulation		
Operating current increases Cooling capacity decreases Due to high discharge temperature, oiling deteriorates, compressor breaks down	Low cooling fluid charge	Gas insufficiency
	Cooling fluid leakage	Gas insufficiency
	Filter drier or damping element is broken down	System failure System failure
Excessive fluid circulation		
Operating current increases  Cooling capacity increases Compressor breaks down due to liquid return	Adjustment of expansion valve is not suitable	Expansion valve
	Expansion valve bulb is placed wrongly	Expansion valve
	Excessive gas charge	Capillary pipe
Insufficient heat carrying in evaporator		
Operating current decreases Cooling capacity decreases Compressor breaks down due to liquid return	Dirty air filter	Air cooling
	Breakdown of evaporator's fan belts	Air cooling
	Inversion of evaporator fan	Air cooling
	Dirty evaporator	Air cooling
	Low air temperature	Air cooling

	Low water flow Low water temperature Decrease in efficiency of water circulation	Water cooling Water cooling Water cooling
Excessive cooling load		
Operating current increases Cooling capacity increases Oiling deteriorates, compressor breaks down	Excessive load Selection of wrong device	
Insufficient discharge		
Operating current decreases Cooling capacity decreases	Decrease in compressor efficiency	

### Water Installation

The equipment which provides carrying and control of the water in the divisions of cooling systems where water is used is called water installation. The main equipment used in water installation includes water pipes, pumps, valves, silt traps, check valves, collectors, manometers and thermometers. Each of the equipment should be compatible with the system. Otherwise, system problems occur as well as individual problems.

### Airing of installation

- Knocking occurs. Lives of pumps and similar equipment decrease.
- Flow decreases, and amount of circulating water decreases.

These problems may lead to insufficient heat transfer in the evaporator, and therefore, decrease in cooling capacity, bearing winding due to lubrication problems or disruption of compressor due to liquid return.

### Expansion tank

If there isn't any expansion tank in the installation or, if any, it doesn't work, air problems begin in the installation and water grows less. And, this situation leads to insufficient heat transfer. Selection methods relating to expansion tank are mentioned below.

### Selection of pump

If selection of pump is wrong, the desired flow cannot be achieved. This situation leads to insufficient heat transfer in the condenser or evaporator. Excess of flow can be determined by increasing system resistance choosing the proper valve.

### Selection of equipment

Equipment: Valve, absorber, check-valve, silt trap, collector...

If the proper equipment isn't selected, it shall be difficult to adjust the desired flow in the installation. In such case, problems occur such as high pressure and insufficient heat transfer in the evaporator.

### Selection and use of measuring tools

Measuring tools in the installation: Thermometer, manometer.

Thermometer is installed to observe operating values of the devices. Manometer is used to determine water pressures in the installation.

Non-determination of water pressures may lead to non-determination of pump's operating values, and therefore, non-determination of whether the needed flow can be achieved or not.

### Water speed

If water speeds in the installation are not selected properly, erosion problems occur and this leads to decrease in life of the installation. Furthermore, performance of the device changes.

Part Name:	Speed (m/sec)
Pump Discharge	2.4-3.6
Pump Suction	1.2-2.1
Main Lines	1.2-4.5
Increasing Lines	0.9-3.0
Branch Lines	1.2-3.0
Supply Water	0.9-2.1
Drainage Water	0.6-1.5

**Table: Recommended Water Speed**

Normal Operation (Hour/Year)	Water Speed (m/sec)
1500	04.June
2000	04.Marc
3000	4.0
4000	03.July
6000	3.0
8000	02.April

**Table: Maximum water speed for minimum erosion**

### Insulation

Insulation of necessary areas of water installation leads to energy losses. For instance, in a system operating at 6-10 °C, reaching of the water coming from cooling device to 7 °C until the place of use means an energy loss of 25%.

## 11. CHILLER COOLING UNIT INCLUSION DECLARATION

Only qualified personnel are authorized to work on the unit.

This product is a defined part to be included in the facilities in accordance with European directive 98/37/EC. Chiller Cooling Devices shall not be operated unless the facility in which the devices are installed is detected or declared to be conformable to the laws in force. For this reason, this product isn't subject to 98/37/EC.

## 12. WARNINGS

IBS ISITMA SOĞUTMA HAVALANDIRMA TAAHHÜT SAN. VE TİC. A.Ş saves the right to amend these instructions without any early notification in order to develop its products continuously.

It should exactly be controlled whether safety automatics cut the circuit and there is any leakage in the system or not by operating the products used at maximum operating pressure once a year.

IBS Isıtma Soğutma Havalandırma Taahhüt San. ve Tic. A.Ş bears no responsibility for the risks that may be encountered after intervention of non-authorized personnel to the failures.

IBS Isıtma Soğutma Havalandırma Taahhüt San. ve Tic. A.Ş bears no responsibility for failures and damages arising out of non-conformance to the terms stated in this operating manual.



# CERTIFICATE OF WARRANTY

Serial No : .....

Date of Invoice-No:...../...../20..... - .....

Warranty period starts as per the date of invoice. Warranty period is 1 (one) year.

The entire product including all parts is under the warranty of our firm.

In case of failure of the product within warranty period, the duration of repair is added to the warranty period. Duration of repair of the product is maximum thirty business days. This period starts when the failure of device is informed to the service station, if no service station is available, to the manufacturer of the product.

Within warranty period of the product, in case of failure due to material and manufacturing defects, no fee shall be claimed under the name of workmanship expenses, cost of replaced part or any other name.

The terms out of the scope of warranty:

Failures due to usage errors.

Failures due to lack of maintenance.

If the devices are serviced and maintained by non-authorized personnel.

Failures due to improper electrical feeding (voltage, frequency changes, harmonic current, etc.).

Operation of faulty devices

Change of device adjustments and safety values (of automatic control elements, thermostats, microprocessor adjustments, set values) without consulting to IBS ISITMA SOĞUTMA HAVALANDIRMA TAAHHÜT SAN. VE TİC. A.Ş or authorized services.

Operation of devices in very hot and/or dirty, dusty, very damp and closed places without taking any precaution.

Failures due to the abovementioned reasons are regarded as out of the scope of warranty.

Title of Seller :

Address :

Tel / Fax :

E-mail :

Seal/Signature :



